

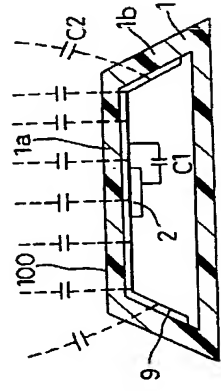
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(54) 【発明の名称】 便座用着座検出装置

(57) 【要約】
【課題】十分な電気絶縁性や防水性を要求される検出電極板を感度の低下を招くことなく小型化でき、更に着座面の加温性にも優れた便座用着座検出装置を提供すること。
【解決手段】便座内部において、金属伝熱板9 3はフローティング電位とされるので、十分な電気絶縁性や防水性を要求される検出電極板2を、感度の低下を招くことなく小型化でき、更に着座面の加温性にも優れた便座用着座検出装置を実現することができる。



【特許請求の範囲】
【請求項1】外主面が着座面をなし内部にキャパティを有する便座と、前記着座面に近接して前記便座内に敷設された便座加熱用の発熱体と、前記発熱体に対して電気絶縁されつつ少なくとも前記着座面に平行して前記便座内に延設される金属伝熱板と、前記金属伝熱板より小型に形成されるときにも前記金属伝熱板に対して電気絶縁されつつ前記便座内に配設される着座検出用の検出電極板と、前記検出電極板を一方の電極とする静電容量変化を検出して前記着座面への着座を検出する回路部とを備える便座用着座検出装置において、前記金属伝熱板は、浮遊電位を有することを特徴とする便座用着座検出装置。
【請求項2】請求項1記載の便座用着座検出装置において、前記金属伝熱板は、前記便座の外表面と前記検出電極板との間に介設されることを特徴とする便座用着座検出装置。
【請求項3】請求項1記載の便座用着座検出装置において、前記検出電極板は、前記金属伝熱板の便座回転軸側の端部に近接して配設されることを特徴とする便座用着座検出装置。
【請求項4】請求項1記載の便座用着座検出装置において、前記検出電極板は、前記着座面の側部に近接配置されることを特徴とする便座用着座検出装置。
【発明の詳細な説明】
【0001】
【発明の属する技術分野】本発明は、便座用着座検出装置に関する。
【0002】
【従来の技術】従来の便座用着座検出装置の一例を図7に示す。便座1の内部は空洞となっており、便座1の上板部1 aの上面が着座面100を構成している。便座1の上板部1 a及び側板部1 bの内面にはヒータ9が設けられており、ヒータ9は、図8に示すように、電熱線部9 1とそれを被覆する絶縁樹脂部9 2と、絶縁樹脂部9 2の上面に接合されたシールド電極箔9 3とからなり、シールド電極箔9 3が接着剤により便座1の上板部1 a及び側板部1 bの内面に貼着されている。このシールド電極箔9 3は、通電により発熱する電熱線部9 1の発熱熱を便座1の着座面100全体に伝達する機能とともに、着座面100への人体の着座を検出するための検出電極板としての機能を兼ねている。
【0003】着座面100への着座は、このシールド電極箔9 3の静電容量の変化を生じさせるので、シールド電極箔9 3に高周波電圧を印加してこのシールド電極箔9 3と大地との間の静電容量変化を電気的に検出することにより、着座が検出される。従来の便座用着座検出装置

図の他例を図9を参照して説明する。
【0004】この従来例では、便座1の上板部1 aの内面とヒータ9との間に用いる検出電極板2を介したものであり、検出電極板2は、図10に示すように絶縁樹脂部2 1により被覆されており、接地電位のシールド電極箔9 3から絶縁分離されている。着座面100への着座は、図7の場合と同様に、この検出電極板2の静電容量の変化を生じさせるので、検出電極板2に高周波電圧を印加してこの検出電極板2と大地との間の静電容量変化を電気的に検出することにより、着座が検出される。
【0005】
【発明が解決しようとする課題】しかしながら、上記した図7に示す従来の便座用着座検出装置では、検出電極板をなすシールド電極箔9 3と電熱線部9 1との間の静電容量が大きいので、電熱線部9 1の通電電圧（通常商用交流電圧）に重畳する高周波ノイズ電圧、特にその着座用電圧の帯域成分が、着座判定動作の誤動作を招く可能性を高めるという問題を有していた。更に、大面積のシールド電極箔9 3を接地電位から浮かせるとともにその全面にわたって十分に電気絶縁し、防水をしなければならぬという問題もあった。
【0006】一方、図9に示す従来の便座用着座検出装置では、シールド電極箔9 3と着座面100との間に着座用の検出電極板2を設けるので、シールド電極箔9 3の接地しておけば電熱線部9 1から検出電極板2への高周波電磁ノイズ電圧の漏入は防止できるという利点を待たない。しかし、電熱線部9 1の発熱の伝達を早める場合、全面にわたって電気絶縁される検出電極板2の存在が、この領域における着座面100の温度上昇速度の遅化を招くという問題、更に、検出電極板2が小型であるので検出感度が低下するという問題点を持っていた。
【0007】従って、本発明は、十分な電気絶縁性や防水性を要求される検出電極板を感度の低下を招くことなく小型化でき、更に着座面の加温性にも優れた便座用着座検出装置を提供することを、その目的としている。
【0008】
【課題を解決するための手段】本発明の第1の構成によれば、便座内部において、金属伝熱板はフローティング電位とされる。このようにすれば、十分な電気絶縁性や防水性を要求される検出電極板を、感度の低下を招くことなく小型化でき、更に着座面の加温性にも優れた便座用着座検出装置を実現することができる。
【0009】更に説明すると、検出電極板は金属伝熱板に近接配置されているので、検出電極板と金属伝熱板との間の静電容量C1は大きく設定できる。また、金属伝熱板は着座面に対して近接するとともに大きな対面積をもつので、着座面に着座した人体に対して極めて大きな静電容量C2を持つ。そこで、金属伝熱板を浮遊電位とすれば、検出電極板は着座した人体に対して大きな静電容量Cs(=1/(1/C1)+(1/C2))を得ることができる。

置もシールド電極箔93に近接する範囲で自由に変更する事ができる。更に、検出電極部200がヒータ9の裏側に配設されることになるので、ヒータ9による便座1の便座面100の加熱の傳導となることがない。更に、この実施例によれば、図1に示すように、検出電極部2は、ヒータ9のシールド電極箔（金属伝熱板）93の便座回転軸側の端部に近接して配設される。このようにして、便座回転軸側の端部近接して配設される。このようにすれば、検出電極部2を、便座1の側板部1b近傍に設置し、その寄生容量を低減することができる。また、他の実施例を図5を参照して説明する。

【0025】この実施例の便座用着座検出装置は、実施例1の便座用着座検出装置（図3、図4参照）において、検出電極部2を、便座1の側板部1b近傍に設置して、検出電極部2を、便座1の側板部1bの引き出し自由2の配設が簡単となり、同軸ケーブル6の引き出し自由度も向上する。なお、検出電極部2は、図6のように、ヒータ9と便座1の側板部1bとの間に配設されても良い。即ち、この場合でも、便座1の上板部1aの上面が、ヒータ9と便座1の側板部1bとの間に検出電極部2が介在することがないので、着座面100の加熱性が低下することがない。

（変形実施例）上記各実施例では、ヒータ9内において、電熱線部91は図4に示すようにシールド電極箔93よりも検出電極部2から遠い位置とされているが、逆の位置構成としてもよいことは明白である。

【0026】また、結合トランス8の二次側の回路の共振周波数の共振回路6の共振周波数を高く設定しておき、着座により静電容量Csが増大し、結合トランス8の二次側の回路の共振周波数が低下して共振回路6の共振周波数と一致するように設定しても良い。この場合は、マイクログリッドヒータ74に力される電圧のレベルと着座状態との関係が上記と反対となる。

【0027】その他、共振回路6、結合トランス8及び検出電極部2を含む回路が共振回路部を構成して、着座の有無による静電容量Csの変化に応じてこの共振回路部の共振、共振停止を行わせて、それをマイクログリッドヒータ74で判定しても良い。更に、同様に、共振回路6、結合トランス8及び検出電極部2を含む回路が共振回路部を構成して、着座の有無による静電容量Csの変化に応じてこの共振回路部の共振周波数を変更し、それをマイクログリッドヒータ74で判定しても良い。

【図面の簡単な説明】
【図1】本発明に係る便座用着座検出装置の概略図を示す模式斜視図である。

【図2】図1の便座用着座検出装置の回路図である。

【図3】図1の便座の一部断面を示す断面図である。

【図4】図3の便座の検出電極部200の拡大断面を示す断面図である。

【図5】他の実施例の便座の一部断面を示す断面図である。

マイクログリッドヒータ74は、この入力デジタル信号が所定レベル以上であれば非着座状態であると判定する。ダイオード回路15は直列接続されたダイオード151～153をもち、上記着座検出信号をなす電圧（着座検出信号電圧）のクランプを行うとともに、検出電極部2の直流電位を規定している。

【0020】結局、検出電極部2、リアクタンス素子13、14及び結合トランス8からなる結合トランス8の二次側の回路は、非着座状態において共振状態にあり、大きな電流が流れ、その結果、検出電極部2には大きな電圧が入力されることになる。ここで、大きな電圧が着座により、電圧が大地と固定される人が便座1に着座すると、振動的に大地と固定される人と検出電極部2との間の静電容量の付加により検出電極部2の静電容量が非着座状態よりも増大し、これにより結合トランス8の二次側の回路の共振周波数は共振回路6の共振周波数からずれ、これにより検出電極部2の共振周波数が減少し、マイクログリッドヒータ74が着座検出を行う。

【0021】次に、本実施例の特徴をなす便座1内の電極構造について図3を参照して説明する。便座1の内部は空洞となっており、便座1の上板部1a及び側板部110bの構成している。便座1の上板部1a及び側板部110bの内部にはヒータ9が配置されている。ヒータ9は、図4に示すように、電熱線部（発熱体）91とそれらを被覆する絶縁樹脂部92と、絶縁樹脂部92の主に接合されたシールド電極箔（金属伝熱板）93とからなる。このシールド電極箔93は、通電により発熱する電熱線部91の発生熱を便座1の通電面100全体に伝達する機能をもつが、本実施例において重要な点はシールド電極箔93が浮遊電位とされている点にある。

【0022】便座1の上板部1aの直下にはヒータ9の裏側に位置して検出電極部2が設けられている。検出電極部2は、図10と同じ断面構造をもち、絶縁樹脂部21によりその全面を被覆されている。絶縁樹脂部21は、検出電極部2をヒータ9から電気絶縁している。なお、絶縁樹脂部21の内面にすなわちキャパシタに露出する面にシールド電極箔を設け、このシールド電極箔をヒータ9のシールド電極箔93と電気的に短絡させ、ヒータ9のシールド電極箔93と検出電極部2との間の静電容量C2を一度増大して感度向上を図ることができる。

【0023】着座面100への着座は、人体（図示せず）とシールド電極箔（金属伝熱板）93との間の静電容量C2を増大させる。シールド電極箔93は浮遊電位であるので、静電容量C2の増大は、検出電極部2は着座した人体との間の静電容量Cs（ $=1/(\frac{1}{C2}) + (1/C2)$ ）を増加させ、これにより、上述のように着座を判別することができる。

【0024】従って、この実施例によれば、検出電極部2を小型とするにもかかわらず、良好な検出感度を得ることができる。また、この小型の検出電極部2の配設位置

検出電極板の静電容量変化に応じて、検出電極板の電位振幅が変化するもので、それを検出することにより着座の有無を検出することができる。

【0016】
【実施例】以下、本発明に係る便座用着座検出装置を図1の概略図により具体的に説明する。この実施例の便座用着座検出装置を図1に示す。1は便座、2は便座1の内部に配設された着座検出用の検出電極部であり、アルミ箔からなる。3はコントロールボックス、4は便座1とコントロールボックス3とを接続する制御ケーブルであり、便座1に内設されたヒータ9などの他の装置の制御も行っている。制御ケーブル4内には、同軸ケーブル6が巻かれており、同軸ケーブル6の芯線の一部はコントロールケーブル6から検出電極部2に接続されている。また、同軸ケーブル6の外側導体はコントロールケーブル6の外側導体に接続されている。

【0017】この便座用着座検出装置の回路図を図2に示す。図2において、61は同軸ケーブル6の芯線、62は同軸ケーブル6の外側導体である。コントロールケーブル6は、発振回路（本発明という共振回路部）2、着座検出回路部7、結合トランス8、リアクタンス素子13、14、ダイオード回路15、コンデンサ16を有している。リアクタンス素子13はたとえばフェライトビーズや空洞コイルからなる。

【0018】81は結合トランス8の一次コイル、82はその二次コイルである。71は検出電極部2の芯線、72は増幅回路、73はA/Dコンバータ、74はマイクログリッドヒータである。以下、コントロールケーブル6の芯線61を通じて検出電極部2に接続され、共振回路6から出力された上記周波数の高周波電圧は、検出電極部2に印加されている。

【0019】また、検出電極部2の大地側の静電容量Csは、便座1に人が着座していない状態（以下、非着座状態という）において、結合トランス8の二次コイル82及びリアクタンス素子13、14とで共振回路6の共振周波数をほぼ共振周波数とするように作製されている。結合トランス8の二次コイル82の一端は接地され、二次コイル82の他端とリアクタンス素子13との接続点はリアクタンス素子13を通じて接地されている。また、二次コイル82の他端とリアクタンス素子13との接続点の電位は、着座検出信号として検出電極部2の検出電極部2の電位に直流信号電圧に変換された後、増幅回路72で電圧増幅され、増幅された直流信号電圧のレベルはA/Dコンバータ73でデジタル信号にA/D変換されて、マイクログリッドヒータ74に入力され、

もつことができ、その結果として、検出電極部を小型とするにもかかわらず、良好な検出感度を得ることができ、なお、金属伝熱板は、浮遊電位とされ、検出電極板のように目的に一定電位に固定される必要がないので、その絶縁は簡単（たとえば便座内に露出）で構わない。更に、金属伝熱板は、着座検出に用いられる高周波帯域で大地に対して高インピーダンスを持てばよい。【0010】この結果、検出電極板を金属伝熱板の任意の箇所に近接させるだけで着座検出ができることがわかる。従って、検出電極板の配設位置を選択することができて、便座内部構造の自由度が増し、検出感度の低下を招くことなく検出電極板の小型化を実現でき、検出電極板を着座面と発熱体との間から排除することにより着座面の加熱性も向上する事ができる。

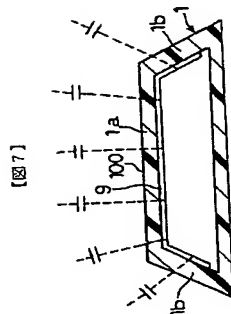
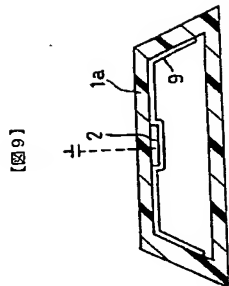
【0011】本発明の第2の構成によれば上記第1の構成において更に、金属伝熱板が便座の外表面と検出電極板との間に介設される。このようにすれば、上記第1の構成の作用効果に加えて特に、着座面の加熱性に優れた便座用着座検出装置を実現することができる。本発明の第3の構成によれば上記第1の構成において更に、検出電極板が金属伝熱板の便座回転軸側の端部に近接して配設される。

【0012】このようにすれば上記第1の構成の作用効果に加えて更に、検出電極板と外部の電子回路部との接続線の長さを知覚してその寄生容量を低減し、着座後に検出電極板の静電容量を増大することにより、この接続線における静電容量変化を増大することにより、この接続線の配設位置のばらつきを低減してそれによる影響の低減が生容量のばらつきを低減してそれによる影響を低減することができる。また、配線費用も低減することができる。

【0013】本発明の第4の構成によれば上記第1の構成において更に、検出電極板が着座面の側面に近接配置される。このようにすれば、検出電極板が便座の側面（上面）と金属伝熱板との間に介在しないので、着座面の加熱性に優れた便座用着座検出装置を実現することができる。

【0014】
【発明の技術的形態】検出電極板は共振回路部とともに共振回路部を構成する事ができる。この場合、検出電極板の大地静電容量の変化により共振回路部に共振とその停止との状態変化を生じさせても良い。又は、検出電極板の大地静電容量の変化により共振回路部の共振周波数の変化を生じさせても良い。前者の場合、着座検出回路部は入力交流信号電圧の共振周波数と着座の有無を判定する。後者の場合、着座検出回路部は入力交流信号電圧の共振周波数と着座の有無を判定する。

【0015】また、共振回路部は一定周波数、一定振幅の高周波電圧を一定のインピーダンスの素子を通じて検出電極板に印加することもできる。このようにすれば、

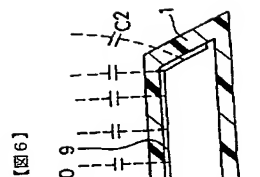
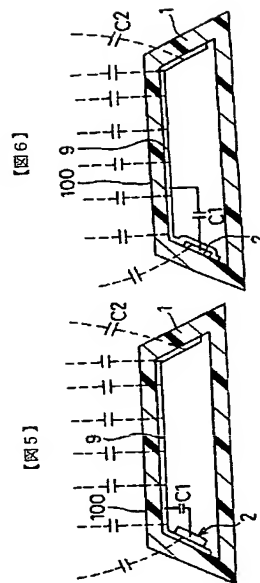
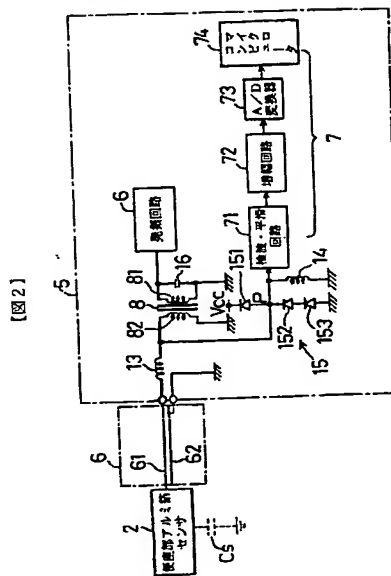
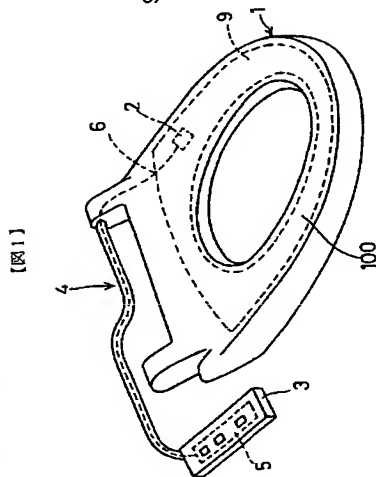
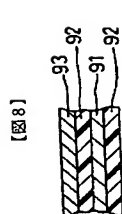
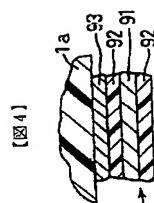
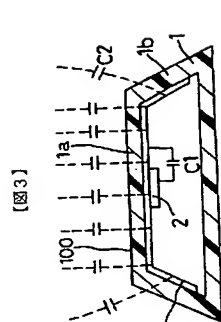


観図である。

図101 図9の屈座の一部断面を示す断面図である。

【符号の説明】

【符号の説明】
1…便座、2…検出電極板、5…コントローラ、9はヒータ、91は電熱線部（発熱体）、93はシールド電極
箱。



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PATENT ABSTRACTS OF JAPAN

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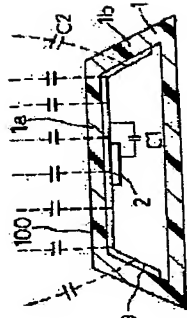
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(21)Application number : 09-070206 (71)Applicant : AISIN SEIKI CO LTD
(22)Date of filing : 24.03.1997 (72)Inventor : TOMITA TADASHI
SATO KENICHI

(54) TOILET SEAT SITTING DETECTOR

(57)Abstract:
PROBLEM TO BE SOLVED: To miniaturize a detection electrode plate and increase the warming property of a sitting surface, by providing the inside of a toilet seat with a metal heat transmission plate as floating potential, relating to a detector detecting sitting on the sitting surface from detection of capacitance variance in which a detection electrode plate is made as one pole.

SOLUTION: The inside of a toilet seat 1 is made to be hollow and, onto the inner plane of the upper board part 1a and side board part 1b of the toilet seat 1 forming a sitting plane 100, a heater 9 is attached. The heater 9 consists of an electric heating wire (heat emitter) 91, insulation resin 92 and shield electrode foil (metal heat transmission plate) 93 which is made to be floating potential. Right under the upper board part 1a, a detection electrode plate 2 is provided to be located on the reverse side of the heater 9, the detection electrode plate 2 is electrically insulated from the heater 9 by means of an insulation resin layer. Further, on the chief inner plane of the insulation resin layer, shield electrode foil is provided, which is short-circuited with the shield electrode foil 93; thus, an enhanced sensitivity is attempted by increasing capacitance C1 between the electrode foil 93 and the detection electrode plate 2.



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CLAIMS

[Claim(s)]
[Claim 1] The heating element for seat heating which the outside principal plane approached the seat which has a cavity for a taking-a-seat side inside nothing, and said taking-a-seat side, and was laid in said seat. The metal heat exchanger plate of right heat-conducting characteristic installed in said seat in parallel with said taking-a-seat side at least, electric insulation being carried out to said heating element. The detection electrode plate for taking-a-seat detection arranged in said seat, electric insulation being carried out to said metal heat exchanger plate while being formed in small from said metal heat exchanger plate having floating equipment for the seats characterized by said metal heat exchanger plate with the circuit potential in the taking-a-seat detection equipment for the seats equipped with the electrode plate section which detects electrostatic-capacity change which uses said detection electrode plate as one electrode, and detects taking a seat to said taking-a-seat side.
[Claim 2] It is taking-a-seat detection equipment for the seats characterized by interposing said metal heat exchanger plate between the outside surface of said seat, and said detection electrode plate in the taking-a-seat detection equipment for the seats according to claim 1.
[Claim 3] It is taking-a-seat detection equipment for the seats characterized by for said detection electrode plate approaching the edge by the side of the seat rotation shaft of said metal heat exchanger plate in the taking-a-seat detection equipment for the seats according to claim 1, and being arranged.
[Claim 4] It is taking-a-seat detection equipment for the seats characterized by carrying out contiguity arrangement of said detection electrode plate at the flank of said taking-a-seat side in the taking-a-seat detection equipment for the seats according to claim 1.

[Translation done.]

out over the whole surface, and there was also a problem that it would not become if there is no waterproofing.

[0006] since the detection electrode plate 2 of dedication is formed between the screening-electrode foil 93 and the taking-a-seat side 100, if the screening-electrode foil 93 is grounded on the other hand with the conventional taking-a-seat detection equipment for the seats shown in drawing 9 -- the RF from the heating-wire section 91 to the detection electrode plate 2 -- electromagnetism -- mixing of a noise electrical potential difference has the advantage that it can prevent. However, when transfer of generation of heat of the heating-wire section 91 was considered, since the detection electrode plate 2 was still smaller, the existence of the detection electrode plate 2 by which electric insulation is carried out over the whole surface had the problem of causing slow-ization of the rate of temperature rise of the taking-a-seat side 100 in this field, and the trouble that detection sensitivity fell.

[0007] therefore -- without this invention invites the detection electrode plate of which sufficient electric insulation and a sufficient water resisting property are required for the fall of sensibility -- it can miniaturize -- further -- warming of a taking-a-seat side -- it sets it as the purpose to offer the taking-a-seat detection equipment for the seats excellent also in the sex. [0008]

[Means for Solving the Problem] According to the 1st configuration of this invention, let a metal heat exchanger plate be floating potential in the interior of the seat, thus -- if it carries out, without it will invite the detection electrode plate of which sufficient electric insulation and a sufficient water resisting property are required for the fall of sensibility -- it can miniaturize -- further -- warming of a taking-a-seat side -- the taking-a-seat detection equipment for the seats excellent also in the sex is realizable.

[0009] Furthermore, if it explains, since contiguity arrangement of the detection electrode plate is carried out at the metal heat exchanger plate, the electrostatic capacity C1 between a detection electrode plate and a metal heat exchanger plate can be set up greatly. Moreover, since a metal heat exchanger plate has a big confrontation area while approaching to a taking-a-seat side, it has the very big electrostatic capacity C2 to the body which sat down to the taking-a-seat side. Then, it is the big electrostatic capacity Cs (it can have $\pm 1/(1/C1) (+1/C2)$) and as the result, in spite of making a detection electrode plate small, good detection sensitivity can be obtained) to the body with which floating potential, then a detection electrode plate sat down the metal heat exchanger plate. In addition, since a metal heat exchanger plate does not have to be made into floating potential and it does not need to be fixed to fixed potential in direct current like a detection electrode plate, easy (it exposes for example, in the seat) is sufficient as the insulation. In short, a metal heat exchanger plate should just have a high impedance to the earth in the high frequency band used for taking-a-seat detection.

[0010] Consequently, it turns out that taking-a-seat detection can be performed only by making a detection electrode plate approach the part of the arbitration of a metal heat exchanger plate. therefore, the thing for which the arrangement location of a detection electrode plate can be chosen, the degree of freedom of leading about of wiring inside the increase of the design degree of freedom of a seat internal structure and the seat increases, the miniaturization of a detection electrode plate can be realized, without causing the fall of detection sensitivity, and a detection electrode plate is eliminated from between a taking-a-seat side and heating elements -- warming of a taking-a-seat side -- a sex can also improve.

[0011] According to the 2nd configuration of this invention, in the 1st configuration of the above, a metal heat exchanger plate is further interposed between the outside surface of the seat, and a detection electrode plate, thus -- if it carries out -- the operation effectiveness of the configuration of the above 1st -- adding -- especially -- warming of a taking-a-seat side -- the taking-a-seat detection equipment for the seats excellent in the sex is realizable. According to the 3rd configuration of this invention, in the 1st configuration of the above, a detection electrode plate is further approached and arranged in the edge by the side of the seat rotation shaft of a metal heat exchanger plate.

[0012] If it does in this way, while in addition to the operation effectiveness of the configuration of the above 1st shortening the die length of the path cord of a detection electrode plate and

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001] [Field of the Invention] This invention relates to the taking-a-seat detection equipment for the seats.

[0002] [Description of the Prior Art] An example of the conventional taking-a-seat detection equipment for the seats is shown in drawing 7. The interior of the seat 1 serves as a cavity, and the top face of superior lamella section 1a of the seat 1 constitutes the taking-a-seat side 100. The heater 9 has pasted the inside of superior lamella section 1a of the seat 1, and side plate section 1b. A heater 9 consists of the heating-wire section (heating element) 91, the insulating resin section 92 which covers it, and a screening-electrode foil 93 pasted up on one principal plane of the insulating resin section 922, as shown in drawing 8, and the screening-electrode foil 93 is stuck on the inside of superior lamella section 1a of the seat 1, and side plate section 1b by adhesives. This screening-electrode foil 93 serves as the function as a detection electrode plate for detecting taking a seat of the body to the taking-a-seat side 100 with the function to transmit the generating heat of the heating-wire section 91 which generates heat by energization to the taking-a-seat side 100 whole of the seat 1.

[0003] Since taking a seat to the taking-a-seat side 100 produces change of the electrostatic capacity of this screening-electrode foil 93, taking a seat is detected by impressing high-frequency voltage to the screening-electrode foil 93, and detecting electrically the electrostatic-capacity change between this screening-electrode foil 93 and earth. The other examples of the conventional taking-a-seat detection equipment for the seats are explained with reference to drawing 9.

[0004] In this conventional example, the detection electrode plate 2 of dedication is infixed between the inside of superior lamella section 1a of the seat 1, and a heater 9, and the detection electrode plate 2 is covered with the insulating resin layer 21 as shown in drawing 10, and insulating separation is carried out from the screening-electrode foil 93 of touch-down potential. Since taking a seat to the taking-a-seat side 100 produces change of the electrostatic capacity of this detection electrode plate 2 like the case of drawing 7, when it impresses high-frequency voltage to the detection electrode plate 2 and detects electrically the electrostatic-capacity change between this detection electrode plate 2 and earth, taking a seat is detected.

[0005] [Problem(s) to be Solved by the Invention] However, with the conventional taking-a-seat detection equipment for the seats shown in above-mentioned drawing 7, since the electrostatic capacity between the screening-electrode foils 93 and the heating-wire sections 91 which make a detection electrode plate be large, it had the RF noise electrical potential difference superimposed on the energization electrical potential difference (usually commercial alternating current electrical potential difference) of the heating-wire section 91, and the problem that where of the band component of the taking-a-seat signal level raised especially possibility cause malfunction of taking-a-seat judging actuation. furthermore, in order to float from touch-down potential, electric insulation of the screening-electrode foil 93 of a large area was fully carried

not set down to the seat 1, the electrostatic capacity Cs between the earths of the detection electrode plate 2 is produced so that the oscillation frequency of an oscillator circuit 6 may be mostly made into resonance frequency by the secondary coil 82 and reactive elements 13 and 14 of the joint transformer 8. The end of the secondary coil 82 of the joint transformer 8 is grounded, and the node of the other end of a secondary coil 82 and a reactive element 13 is grounded through the reactive element 13. Moreover, after detection smooth [of the potential of the node of the other end of a secondary coil 82 and a reactive element 13] is carried out as a taking-a-seat detecting signal in the detection smoothing circuit 71 and it is transformed into a direct current signal electrical potential difference, the voltage of it is amplified in an amplifying circuit 72, and A/D conversion of the level of the amplified direct current signal electrical potential difference is carried out to a digital signal by A/D converter 73, and it is inputted into a microcomputer 74, and judges with a microcomputer 74 being in the condition of not sitting down, if this input digital signal is more than predetermined level. The diode circuit 15 had the diodes 151-153 by which series connection was carried out, and while clamping the electrical potential difference (taking-a-seat detection signal level) which makes the above-mentioned taking-a-seat detecting signal, the direct-current potential of the detection electrode plate 2 is specified.

[0020] The secondary circuit of the joint transformer 8 which consists of the detection electrode plate 2, reactive elements 13 and 14, and a joint transformer 8 is in the resonance state in the condition of not sitting down, after all, and a big current will flow, consequently big high-frequency voltage will be inputted into the detection smoothing circuit 71. If people sit down to the seat 1, the electrostatic capacity of the detection electrode plate 2 will increase rather than the condition of not sitting down here, by addition of the electrostatic capacity between the bodies and the detection electrode plates 2 which can be assumed to be the earth in false. Thereby, the resonance frequency of the secondary circuit of the above-mentioned joint transformer 8 shifts from the oscillation frequency of an oscillator circuit 6, the taking-a-seat detection signal level inputted into the detection smoothing circuit 71 by this decreases, and a microcomputer 74 performs taking-a-seat detection.

[0021] Next, the electrode structure in the seat 1 which makes the description of this example is explained with reference to drawing 3. The interior of the seat 1 serves as a cavity, and the top face of superior lamella section 1a of the seat 1 constitutes the taking-a-seat side 100. The heater 9 has pasted the inside of superior lamella section 1a of the seat 1, and side plate section 1b. A heater 9 consists of the heating-wire section (heating element) 91, the insulating resin section 92 which covers it, and a screening-electrode foil (metal heat exchanger plate) 93 pasted up on the principal plane of the insulating resin section 92, as shown in drawing 4. Although this screening-electrode foil 93 has the function to transmit the generating heat of the heating-wire section 91 which generates heat by energization to the taking-a-seat side 100 whole of the seat 1, in this example, an important point is in the point that the screening-electrode foil 93 is made into floating potential.

[0022] It is located directly under superior lamella section 1a of the seat 1 on the background of a heater 9, and the detection electrode plate 2 is formed. The detection electrode plate 2 has the same cross-section structure as drawing 10, and is having the whole surface covered with the insulating resin layer 21. The insulating resin layer 21 is carrying out electric insulation of the detection electrode plate 2 from the heater 9. In addition, if a screening-electrode foil is formed in the principal plane exposed to the inner principal plane of the insulating resin layer 21, i.e., a cavity, and this screening-electrode foil is electrically connected with the screening-electrode foil 93 of a heater 9 too hastily, the electrostatic capacity C1 between the screening-electrode foil 93 and the detection electrode plate 2 is increased further, and improvement in sensibility can be aimed at.

[0023] Taking a seat to the taking-a-seat side 100 increases the electrostatic capacity C2 between the body (not shown) and the screening-electrode foil (metal heat exchanger plate) 93. Increase of electrostatic capacity C2 is the electrostatic capacity Cs between the bodies with which the detection electrode plate 2 sat down since the screening-electrode foil 93 was floating potential ($= 1/(1/C1) + (1/C2)$) is made to increase, and, thereby, taking a seat can be

external electronic-circuitry equipment further, reducing that parasitic capacitance and increasing the electrostatic-capacity change before and behind taking a seat, dispersion in the above-mentioned parasitic capacitance between this path cord and body by dispersion in the wiring location of this path cord can be reduced, and the bad influence by it can be reduced.

Moreover, wiring costs can also be reduced.

[0013] According to the 4th configuration of this invention, in the 1st configuration of the above, contiguity arrangement of the detection electrode plate is carried out further at the flank of a taking-a-seat side, thus -- if it carries out, since a detection electrode plate does not intervene between the taking-a-seat side (top face) of the seat, and a metal heat exchanger plate -- warning of a taking-a-seat side -- the taking-a-seat detection equipment for the seats excellent in the sex is realizable.

[0014]

[Embodiment of the Invention] A detection electrode plate can constitute an oscillator-circuit system with the oscillator-circuit section. In this case, an oscillator-circuit system may be made to produce the change of state of an oscillation and its halt by change of the earth electrostatic capacity of a detection electrode plate. Or change of the oscillation frequency of an oscillator-circuit system may be produced by change of the earth electrostatic capacity of a detection electrode plate. In the case of the former, the taking-a-seat detector section judges the existence of taking a seat by amplitude change of an input alternating current signal level. In the case of the latter, the taking-a-seat detector section judges the existence of taking a seat by frequency change of an input alternating current signal level.

[0015] Moreover, the oscillator-circuit section can also impress the high-frequency voltage of constant frequency and the fixed amplitude to a detection electrode plate through the component of a fixed impedance. If it does in this way, since the potential amplitude of a detection electrode plate will change according to electrostatic-capacity change of a detection electrode plate, the existence of taking a seat is detectable by detecting it.

[0016]

[Example] Hereafter, the example of illustration explains concretely the taking-a-seat detection equipment for the seats concerning this invention. The taking-a-seat detection equipment for the seats of this example is shown in drawing 1. It is the detection electrode plate for taking-a-seat detection with which 1 was arranged by the seat and 2 was arranged in the interior of the seat 1, and consists of aluminum foil. The resin pipe to which 3 connects a control box to and 4 connects the seat 1 and a control box 3, and 5 are the controllers formed in the control box 3, and control of other equipments, such as the heater 9 installed inside by the seat 1, is also performed. The coaxial cable 6 is laid in the resin pipe 4, the end of the core wire of a coaxial cable 6 is connected to a controller 5, and the other end is connected to the detection electrode plate 2, moreover, the outside of a coaxial cable 6 -- the conductor is connected to the earth electrode of a controller 5.

[0017] The circuit diagram of this taking-a-seat detection equipment for the seats is shown in drawing 2, drawing 2 -- setting -- 61 -- the core wire of a coaxial cable 6, and 62 -- the outside of a coaxial cable 6 -- it is a conductor. The controller 5 has an oscillator circuit (oscillator-circuit section as used in the field of this invention) 6, the taking-a-seat detector section 7, the joint transformer 8, reactive elements 13 and 14, the diode circuit 15, and the capacitor 16. A reactive element 13 consists of a ferrite bead or a cavernous coil.

[0018] 81 is the primary coil of the joint transformer 8, and 82 is the secondary coil. For 71, as for an amplifying circuit and 73, a detection smoothing circuit and 72 are [an A/D converter and 74] microcomputers. Hereafter, the circuitry of a controller 5 and its actuation are explained in more detail. The capacitor 16 is produced so that it may resonate on the oscillation frequency of an oscillator circuit 6 with the inductance of the primary coil 81 of the joint transformer 8. The secondary coil 82 of the joint transformer 8 is connected to the detection electrode plate 2 through a reactive element 13 and the core wire 61 of a coaxial cable 6, and the high-frequency voltage of the above-mentioned frequency outputted from the oscillator circuit 6 is impressed to the detection electrode plate 2.

[0019] Moreover, in the condition (henceforth the condition of not sitting down) that people have

distinguished as mentioned above.).

[0024] Therefore, according to this example, in spite of making the detection electrode plate 2 small, good detection sensitivity can be obtained. Moreover, the arrangement location of this small detection electrode plate 2 can also be freely changed in the range close to the screening-electrode foil 93. Furthermore, since the detection polar zone 200 will be arranged in the background of a heater 9, it does not become the failure of heating of the seat side 100 of the seat 1 at a heater 9. Furthermore, according to this example, as shown in drawing 1, the detection electrode plate 2 is approached and arranged in the edge by the side of the seat rotation shaft of the screening-electrode foil (metal heat exchanger plate) 93 of a heater 9. Without falling sensibility, if it does in this way, compaction of the die length of a coaxial cable 6 can be realized, and the parasitic capacitance can be reduced.

(Example 2) others -- an example is explained with reference to drawing 5.

[0025] In the taking-a-seat detection equipment for the seats of an example 1 (refer to drawing 3, and drawing 4), the taking-a-seat detection equipment for the seats of this example can shift the detection electrode plate 2 near the side plate section 1b of the seat 1, and arranges it. If it does in this way, arrangement of the detection electrode plate 2 will be an easy next door. The leading-about degree of freedom of a coaxial cable 6 also improves. In addition, the detection electrode plate 2 may be arranged between a heater 9 and side plate section 1b of the seat 1 like drawing 6. That is, since the detection electrode plate 2 does not intervene even in this case between the taking-a-seat sides 100 and heaters 9 which consist of a top face of superior lamella section 1a of the seat 1, the heating nature of the taking-a-seat side 100 does not fall. (Deformation embodiment) Although it considers as the arrangement further than the screening-electrode foil 93 from the detection electrode plate 2 in each above-mentioned example as the heating-wire section 91 is shown in a heater 9 at drawing 4, it is clear that it is good also as a reverse location configuration.

[0026] Moreover, it sets up more highly than the oscillation frequency of the oscillator circuit 6 of the resonance frequency of the secondary circuit of the joint transformer 8, electrostatic capacity Cs increases by taking a seat, and you may set up so that the resonance frequency of the secondary circuit of the joint transformer 8 may fall and it may be in agreement with the oscillation frequency of an oscillator circuit 6. In this case, the relation in the level of a signal level and the taking-a-seat condition of being inputted into a microcomputer 74 becomes opposite to the above.

[0027] In addition, the circuit containing an oscillator circuit 6, the joint transformer 8, and the detection electrode plate 2 may constitute the oscillator-circuit section, the oscillation of this oscillator-circuit section and quenching may be made to perform according to change of the electrostatic capacity Cs by the existence of taking a seat, and it may be judged with a microcomputer 74. Furthermore, the circuit containing an oscillator circuit 6, the joint transformer 8, and the detection electrode plate 2 may constitute the oscillator-circuit section similarly, the oscillation frequency of this oscillator-circuit section may be changed according to change of the electrostatic capacity Cs by the existence of taking a seat, and it may be judged with a microcomputer 12.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the ** type perspective view showing the example of the taking-a-seat detection equipment for the seats concerning this invention.
[Drawing 2] It is the circuit diagram of the taking-a-seat detection equipment for the seats of drawing 1.
[Drawing 3] It is the sectional view of the seat of drawing 1 showing a cross section in part.
[Drawing 4] It is the sectional view showing the enlarged section of the detection polar zone 200 of the seat of drawing 3.
[Drawing 5] It is the sectional view of the seat of other examples showing a cross section in part.
[Drawing 6] It is the sectional view of the seat of other examples showing a cross section in part.
[Drawing 7] It is the ** type perspective view showing an example of the conventional taking-a-seat detection equipment for the seats.
[Drawing 8] It is the sectional view of the seat of drawing 8 showing a cross section in part.
[Drawing 9] It is the ** type perspective view showing the other examples of the conventional taking-a-seat detection equipment for the seats.
[Drawing 10] It is the sectional view of the seat of drawing 9 showing a cross section in part.
[Description of Notations]
1 -- The seat. 2 -- A detection electrode plate. 5 -- For a heater and 91, the heating-wire section (heating element) and 93 are [a controller and 9] a screening-electrode foil.

[Translation done.]